

## OCEAN GALES AND STORMS, DECEMBER 1933—Continued

Vessel	Voyage		Position at time of lowest barometer		Gale began	Time of lowest barometer	Gale ended	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH PACIFIC OCEAN													
Hakutatsu Maru, Jap. S.S.	Kamaishi	Vancouver	49 30 N	131 00 W	Dec. 10	3a., 14.	Dec. 12	Inches 29.67	NE	NW, 6.	N	N, 10.	None.
Hiye Maru, Jap.M.S.	Vancouver	Yokohama	47 26 N	163 26 E	Dec. 15	10p., 15.	Dec. 16	29.16	ESE	SSE, 9.	SW	SE, 9.	SE-S.
Yuri Maru, Jap.S.S.	Iloilo	Balboa	31 05 N	142 38 E	Dec. 16	4p., 17.	Dec. 18	29.55	S	W, 9.	NW	S, 10.	10 points.
Michigan, Am.S.S.	Dairen	San Francisco.	41 23 N	169 48 E	do	11p., 16.	Dec. 17	28.83	NW	NW, 8.	WSW	WSW, 10.	NW-W.
Hiye Maru, Jap.M.S.	Vancouver	Yokohama	41 50 N	149 58 E	Dec. 17	6p., 17.	do	29.10	SE	S, 8.	W	SSE, 9.	SSE-S-SW.
California, Ital.S.S.	San Francisco.	Vancouver	43 25 N	125 07 W	do	9p., 17.	Dec. 18	29.96	S	SSW, 8.	WSW	SSW, 8.	S-SSW-SW.
Iwatesan Maru, Jap.S.S.	Yokohama	Los Angeles	46 46 N	170 37 W	Dec. 18	6p., 18.	Dec. 20	29.41	E	E, 9.	E	E, 10.	Steady.
Kentucky, Am.S.S.	Philippine Islands.	San Francisco.	38 23 N	166 10 E	Dec. 19	8a., 19.	Dec. 19	29.15	NW	NW, 6.	NW	NW, 8.	None.
Golden Star, Am.S.S.	do	do	43 27 N	143 34 W	do	3p., 19.	do	29.12	WSW	SW, 9.	W	SW, 10.	SW-WSW.
President Jackson, Am. S.S.	Yokohama	Victoria.	45 30 N	164 50 E	Dec. 16	Mdt., 19.	Dec. 18	28.66	S	W, 7.	W	W, 9.	W-WSW.
Do	do	do	47 42 N	174 28 E	Dec. 21	6a., 21.	Dec. 21	29.01	E	E, 9.	E	E, 10.	NE-E.
Hanover, Am.S.S.	Los Angeles	Honolulu	24 15 N	149 11 W	Dec. 22	4a., 22.	Dec. 22	29.69	SSE	SSE, 8.	SW	SSW, 9.	SSE-S.
Mojave, Am.S.S.	Manila	Los Angeles	43 00 N	155 30 W	do	Mdt., 22.	Dec. 23	28.92	E	SSE, 9.	S	ENE, 10.	E-SSE-S.
Iwatesan Maru, Jap.S.S.	Yokohama	do	46 44 N	159 00 W	do	Noon, 23.	do	29.02	E	ENE	E	ENE, 11.	E-ENE.
Michigan, Am.S.S.	Dairen	San Francisco.	41 12 N	156 30 W	Dec. 21	Mdt., 21.	do	28.41	E	E, 8.	SSW	SW, 10.	ESE-E.
Hikawa Maru, Jap.M.S.	Yokohama	Seattle	50 03 N	155 13 W	Dec. 23	4a., 25.	Dec. 25	28.77	E	E, 8.	ESE	NE, 10.	E-ESE.
Michigan, Am.S.S.	Dairen	San Francisco.	40 35 N	151 40 W	Dec. 24	11a., 24.	do	28.47	WSW	NE, 4.	SE	SW, 9.	ESE-N-WNW.
Niagara, Br.S.S.	Honolulu	Victoria.	29 10 N	151 01 W	do	4a., 24.	Dec. 24	29.51	WSW	SW, 7.	WSW	WSW, 8.	SSE-SSW.
Mojave, Am.S.S.	Manila	Los Angeles	43 15 N	149 20 W	do	5p., 24.	do	28.78	SSE	S, 9.	SSW	SSW, 10.	SSW-SSW.
Koyo Maru, Jap.S.S.	Yokohama	do	36 20 N	177 19 W	Dec. 23	Mdt., 24.	do	29.24	WNW	WSW, 5.	WNW	WNW, 8.	WNW-WSW-W.
President Jackson, Am. S.S.	do	Victoria.	49 49 N	155 44 W	Dec. 22	8a., 25.	Dec. 25	28.68	E	E, 5.	E	NE, 12.	E-SE.
Tacoma, Am.S.S.	Dairen	Vancouver	49 54 N	170 12 W	Dec. 28	10a., 28.	Dec. 28	28.54	WSW	S, 7.	SW	SW, 8.	E-S-WSW.
Zuiyo Maru, Jap.S.S.	Yokohama	Los Angeles	39 27 N	155 39 W	Dec. 29	8p., 29.	Dec. 30	29.60	WSW	WSW, 8.	NNW	WNW, 10.	SW-WSW-W.
President Pierce, Am.S.S.	do	Honolulu	32 58 N	167 54 E	do	Noon, 30.	Dec. 31	29.92	S	SW, 10.	W	SW, 10.	SW-W.
Koyo Maru, Jap.S.S.	do	Los Angeles	36 27 N	143 09 W	Dec. 30	6p., 30.	do	29.46	WNW	WNW, 8.	WNW	WNW, 8.	Steady.
New Orleans, Am.M.S.	Shanghai	do	42 35 N	152 40 W	Dec. 31	2a., 30.	do	29.27	NW	W, 4.	NW	NW, 8.	SSW-W-WNW.

<sup>2</sup> Uncorrected.

## NORTH PACIFIC OCEAN, DECEMBER 1933

By WILLIS E. HURD

**Atmospheric pressure.**—The pressure situation over the North Pacific Ocean in December 1933 was unusually abnormal, and constituted a reversal of usual conditions. During the first 24 days of the month high barometer prevailed over the Aleutian area, except for a few days in the Gulf of Alaska, and abnormally low pressure persisted during the greater part of December after the 8th in lower central waters of the ocean. At St. Paul the average barometer was 0.59 inch above the normal, and at Midway Island, it was 0.20 inch below. While heavy plus departures occurred down the American coast from Point Barrow to Juneau, Tatoosh Island stood out sharply with a minus departure of 0.18 inch.

TABLE 1.—Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, December 1933, at selected stations

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	Inch	Inches		Inches	
Point Barrow <sup>1</sup>	30.30	+0.28	30.72	31	29.76	6
Dutch Harbor	30.10	+ .54	30.72	12	29.02	26
St. Paul	30.17	+ .59	30.74	12	29.10	29
Kodiak	29.94	+ .39	30.50	10	29.02	5
Juneau	29.98	+ .17	30.52	23	29.02	5
Tatoosh Island	29.78	— .18	30.27	23	29.21	11
San Francisco	30.11	— .01	30.47	17	29.61	31
Mazatlan	29.98	+ .05	30.04	14, 20	29.86	7
Honolulu	30.00	— .01	30.19	29	29.68	22
Midway Island	29.81	— .20	30.10	4, 5	29.44	22
Guam	29.82	— .05	29.96	29	29.66	9
Manila	29.84	— .08	29.90	5, 31	29.78	14, 19, 27
Naha	30.06	— .02	30.20	4	29.76	29
Chichishima	29.93	— .07	30.16	4, 6	29.78	9
Nemuro	29.76	— .08	30.28	8	29.20	20

<sup>1</sup> For 22 days.

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

The average centers of high pressure this month lay between California and the Hawaiian Islands, over Bering Sea, and over southeastern Asiatic waters. The average centers of low pressure lay over midocean and the waters about northern Japan and the Kuril Islands.

The lowest recorded pressure reading for the month was 28.41, reported by the American steamer *Michigan*, on the 23d, in latitude 41°12' N., longitude 156°30' W. The highest reading was 30.74, reported on the 12th at St. Paul.

**Cyclones and gales.**—The scene of major storm activity on the North Pacific Ocean this month lay north of the thirtieth parallel, between longitude 165° W. and the American coast, which included a great region lying between the remarkable high pressure region over western Alaskan waters and the anticyclone situated southwest of California.

The coastal waters of Washington and Oregon were abnormally stormy, with cyclonic conditions prevalent during the greater part of the first 3 weeks of December. On the 1st and 2d fresh southerly gales swept this coast. On the 5th the American steamer *Tejon*, going south from Portland in the early morning, encountered southerly hurricane winds after passing outside the bar, and continued in violent winds until night. On the 11th and 12th fresh to whole southerly gales (forces 8 to 10) occurred here, and on the 17th to 20th high winds not only swept coastal waters, but, carried inland with heavy rains, caused thousands of dollars worth of damage over the western parts of the adjoining States.

Farther from the coast, to 165° W., gales were experienced on about half the days of the month between latitudes 35° and 50° N. They were particularly widespread on the 10th to 12th, with wind forces of 8 to 10 reported from most of the area and forces of 11 noted by two ships on the 10th and 11th, as indicated by the table of gales. On the 23d to 24th gales of force 11 to those of

hurricane velocity were reported from the region 45°-50° N., 155°-165° W.

The 10th to 11th were also stormy over much of the western part of the ocean along the northern and middle steamer routes between longitudes 150° and 170° E., with wind forces of 8 to 10 over much of the area. These dates, with the 16th to 18th, constitute the principal periods of storm activity in east longitudes.

Along the Lower California-Hawaiian routes very little stormy weather was experienced, although the usual trade winds were reduced in prevalence, owing to the southward extension of Lows and the consequent intrusion of winds with westerly component during several days of the month. The principal gale noted in near-Hawaiian waters was that of the 22d, south-southwest,

force 9, near 24° N., 148° W. On the 4th to 7th an east gale, varying in force from 8 to 9, was encountered as far south as about 11° N., 146° W.

*Tehuantepecers.*—Northers occurred in the Gulf of Tehuantepec as follows: Of force 9 on the 9th, and of force 7 on the 19th.

*Fog.*—The number of days on which fog was reported along the California coast was 6, which is less than half the number of days of occurrence in November. Along the west coast of Lower California 8 days with fog were reported, which is twice the number noted in November. Fog was mostly widely scattered elsewhere over the ocean, and occurred in the extreme on only 4 days in any given 5° square. In east longitudes it was reported on only 3 days altogether.

## CLIMATOLOGICAL TABLES

### CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

*Condensed climatological summary of temperature and precipitation by sections, December 1933*

[For description of table and charts, see REVIEW, January, p. 37]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
Alabama.....	56.6	+8.9	3 stations.....	85	11	Riverton.....	15	28	3.22	-1.73	Citronelle.....	6.36	Geneva.....	1.36
Arizona.....	47.2	+2.8	Granite Reef Dam.....	88	25	Fort Valley.....	-5	17	.25	-.94	Williams.....	1.20	17 stations.....	.00
Arkansas.....	49.3	+6.5	Camden.....	83	5	Oseola.....	11	27	5.41	+1.11	Clarendon.....	12.01	Gravette.....	1.80
California.....	45.4	-1	San Jacinto.....	90	8	Portola.....	-11	16	5.95	+2.23	Upper Mattole.....	25.40	2 stations.....	.00
Colorado.....	33.3	+8.0	2 stations.....	75	10	Sunbeam (near).....	-24	17	1.17	+ .25	Columbine.....	3.23	Delta.....	.03
Florida.....	64.3	+4.3	Fellsmere.....	89	26	Cottage Hill.....	26	8	.60	-2.20	Vernon.....	2.39	3 stations.....	.00
Georgia.....	55.3	+7.2	Fargo.....	85	17	Blairsville.....	11	10	1.79	-2.51	Dahlonega.....	5.11	Dover.....	.42
Idaho.....	34.2	+8.4	Glenns Ferry.....	75	11	Obsidian.....	-14	17	4.39	+2.41	Roland.....	28.23	Mud Lake.....	.14
Illinois.....	35.0	+4.5	Sparta.....	75	15	Freeport.....	-26	27	1.46	-.81	Golconda.....	3.45	Morrisonville.....	.43
Indiana.....	36.2	+3.9	Rome.....	77	15	Wheatfield.....	-13	27	2.26	-.64	Evans Landing.....	5.46	Goshen.....	.43
Iowa.....	27.1	+3.1	Clarinda.....	69	22	Fayette.....	-30	27	1.05	-.15	Keokuk No. 2.....	2.03	Tracy.....	.22
Kansas.....	39.6	+6.8	Medicine Lodge.....	78	10	Burr Oak.....	0	26	1.27	+ .40	2 stations.....	2.78	Kismet.....	.7
Kentucky.....	44.2	+6.3	Quicksand.....	75	17	Shelbyville.....	-5	27	4.99	+ .97	Glasgow.....	7.97	Uniontown.....	2.19
Louisiana.....	61.6	+9.2	Dodson.....	87	2	2 stations.....	24	17	4.98	-.44	Robeline.....	10.46	Bogalusa.....	.46
Maryland-Delaware.....	36.5	+1.1	Hancock, Md.....	73	24	Oakland, Md.....	-10	28	3.00	-.15	Oakland, Md.....	4.80	Chewsville, Md.....	1.58
Michigan.....	23.8	-1.4	Midland.....	64	1	Vanderbilt.....	-37	29	1.87	-.21	Alpena (near).....	4.24	Cassopolis.....	.41
Minnesota.....	10.8	-4.8	3 stations.....	53	14	Big Falls.....	-51	28	1.08	+ .30	Park Rapids.....	3.16	New London.....	.24
Mississippi.....	56.9	+8.5	Columbia.....	85	16	3 stations.....	15	27	4.29	-1.07	Hernando.....	10.18	Poplarville.....	1.43
Missouri.....	39.1	+5.0	Warsaw.....	78	16	Downing.....	-7	27	1.82	-.25	New Madrid.....	4.65	Lucerne.....	.76
Montana.....	24.1	+1.3	Wyola.....	68	22	Frazer.....	-34	26	2.05	+1.16	Heron.....	15.92	Ennis.....	.07
Nebraska.....	32.6	+6.7	2 stations.....	76	122	3 stations.....	-17	26	1.17	+ .47	Kearney.....	2.53	Culbertson.....	.10
Nevada.....	33.0	+7.4	do.....	75	12	Elko.....	-9	17	1.06	+ .08	Lewers Ranch.....	5.83	Beatty.....	.02
New England.....	20.8	-5.8	Storrs, Conn.....	62	1	Bloomfield, Vt.....	-50	30	3.50	+ .18	Lincoln, Maine.....	7.96	Bethlehem, N.H.....	1.32
New Jersey.....	31.8	-1.9	Tuckerton.....	72	1	Runyon.....	-18	28	3.19	-.46	Freehold.....	5.77	Layton.....	2.12
New Mexico.....	39.7	+5.9	Hagerman.....	90	12	Gavilan (near).....	-16	17	.26	-.44	Bateman Ranch.....	2.14	60 stations.....	.00
New York.....	24.5	-2.3	Angelica.....	65	4	Philadelphia.....	-47	29	2.87	-.06	South Wales.....	5.13	Letchworth Park.....	1.46
North Carolina.....	48.3	+5.6	Belhaven.....	80	17	2 stations.....	7	127	1.73	-2.13	Rock House.....	5.66	Kenansville.....	.11
North Dakota.....	8.6	-4.0	New England.....	62	2	Langdon.....	-38	128	.88	+ .36	Howard.....	2.35	Wishek.....	.00
Ohio.....	34.4	+2.7	Philo (1).....	74	5	2 stations.....	-12	27	2.75	-.04	Portsmouth.....	6.84	Defiance.....	1.15
Oklahoma.....	46.5	+6.8	Hollis.....	84	10	do.....	9	27	1.59	-.12	Wyandotte.....	4.08	Goodwell.....	.03
Oregon.....	40.5	+7.2	2 stations.....	74	10	Sand Creek.....	-12	16	6.41	+2.62	Crossett.....	38.00	Lake.....	.07
Pennsylvania.....	31.7	+ .6	Marcus Hook.....	74	1	Montrose.....	-22	29	2.85	-.28	Clymer.....	6.01	Montrose.....	1.30
South Carolina.....	52.1	+5.3	2 stations.....	82	18	2 stations.....	17	127	1.39	-2.24	Caesars Head.....	6.36	2 stations.....	.00
South Dakota.....	21.8	+1.1	do.....	70	22	La Delle.....	-32	26	.56	-.02	Forestburg.....	1.28	Ottumwa.....	.7
Tennessee.....	48.5	+7.7	Milan.....	78	4	Cedar Hill.....	8	27	5.41	+ .75	Moscow.....	12.89	Embsville.....	1.96
Texas.....	56.7	+7.2	Laredo.....	95	5	Romero.....	9	18	1.88	-.31	Jefferson.....	9.22	21 stations.....	.00
Utah.....	33.7	+7.4	Flute Dam.....	70	13	Woodruff.....	-24	17	1.15	+ .08	Silver Lake.....	6.09	Emery.....	.7
Virginia.....	42.5	+4.4	Hopewell.....	81	23	Mount Weather.....	0	30	2.54	-.58	Pennington Gap.....	4.72	Norfolk.....	.66
Washington.....	38.1	+3.9	Wahluke.....	74	21	Stockdills Ranch.....	-9	27	14.49	+9.04	Cougar (near).....	57.04	Mottling.....	1.07
West Virginia.....	38.7	+4.0	Charleston.....	78	17	4 stations.....	-5	127	4.10	+ .74	Sutton.....	6.15	Upper Tract.....	.87
Wisconsin.....	18.6	-1.8	2 stations.....	57	12	Rest Lake.....	-40	28	1.23	-.09	Flambeau Reservoir.....	2.62	Eau Claire.....	.41
Wyoming.....	30.4	+8.8	Barnum.....	73	23	Sage.....	-25	17	.61	-.14	Bechler River.....	6.00	3 stations.....	.0
Alaska (November).....	16.7	+1.4	Ketchikan.....	56	1	Fort Yukon.....	-43	127	3.80	+ .86	View Cove.....	30.89	Barrow.....	.11
Hawaii.....	70.8	+1.0	Pahala.....	90	1	Kanalohulu.....	39	1	6.19	-3.77	Eke.....	28.00	Puu Alaula.....	.00
Puerto Rico.....	74.1	-.3	2 stations.....	91	13	Guineo Reservoir.....	48	16	4.48	-.02	Rio Blanco.....	14.03	Mona Island.....	.22

<sup>1</sup> Other dates also.